“Studies On Physico-chemical Parameters And Ichthyofaunal Diversity of Niwali Reservoir, Parbhani, (M. S.) India”

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Introduction

Fish are aquatic, marine, freshwater, herbivores or carnivores, cold-blooded, oviparous, or ovoviviparous vertebrate animal. The body is usually spindle-shaped, streamlined, and differentiated into the head, trunk, and tail. Fish are important components of an ecosystem from an ecological, medicinal, nutritional, and economic point of view. Fish constitute a major component of the diet of the human being. They are extensively used as a protein-rich food for human consumption. From a medicinal point of view, Fish provides vitamins like A, D, E, K, and B12, fish manure, fish glue, dried fins, fish leather, etc. besides being rich in calcium, iron, phosphorous, and iodine for human diet (K.D. Kaldate).

Fishes are important elements in the economy of many nations as they have been a staple item in the diet of many people. They constitute slightly more than one-half of the total number of approximately 54,711 recognized living vertebrate species; there are descriptions of an estimated 27,977 valid species of fishes (Nelson, J.S., 2006) Freshwater biodiversity has declined faster than either terrestrial or marine biodiversity over the past 30 years (Jenkins, M., 2003.) Declining river flow rates (discharge) have been a major reduced by warming temperatures, reduced precipitation, and increased water withdrawal for agriculture and other human uses. The streams and rivers are facing several environmental problems throughout the world largely associated with anthropogenic activities in their catchment areas (Young, R., C. et. al., 2004). Fish constitute almost half of the total number of vertebrates in the world They live in almost all conceivable aquatic habitat 21,723 living species of fish has been recorded out of 39,900 species of vertebrate of these 8,411 are freshwater species and 11,650 are marine in India is one of the mega biodiversity in the world and occupies the ninth position in turn of freshwater mega biodiversity. (Jayaram, K.C., 1999.)

Reservoirs are the most prone to be disturbed by anthropogenic activities. These activities cause modification in habitat qualities of large water bodies. This in turn affects the aquatic organisms and a large number of species become threatened or even get extinct. Fishes are considered a good indicator of the health of the river ecosystems as many workers have suggested regarding the use of fishes as bioindicators such as (Whitfield AK, Ellioh M., 2002). Local environmental factors of any water body play a crucial role in the sustainability of ichthyofauna of that particular place Local environmental factors of any water body play a crucial role in the sustainability of ichthyofauna of that particular place (Pires AM, et. al., 1999).

India is chiefly depending upon the monsoon rains for water. There are no satisfactory and proper methods for the conservation of water, which is carried to the seas and oceans. Whatever fresh water collected in reservoirs, reservoirs, and freshwater bodies are endangering due to various activities of humans. According to different surveys, 70 to 80 % of the Indian water sources are polluted and different enteric diseases affect millions of people every year. United Nations Organization reports have indicated that the majority of the world population lacks reliable sources of drinking water. Thus, it is apparent that appropriate and scientific steps are essential to reduce the stresses of pollution and deterioration of freshwater

ecosystems, otherwise, freshwater will become the limiting factor of human society. (Odum,1975) Water quality provides current information about the concentration of various solutes at a given place and time. Parameter provides the basis for judging the suitability of water for its designated uses and to improve existing conditions. The quantitative and qualitative changes in freshwater generally affect all the ecosystems existing in the biosphere. Scientists have realized that hydrobiological and limnological studies are essential to formulate the steps to conserve and maintain valuable inland waters. (Lioyd, 1992).

The Physicochemical characteristics of a water body exert a great effect on biota present in a water body. (Samrat et.al.2012) The interrelationship between the Physico-chemical parameters and Fish production of reservoir water and its relation to the fluctuation of zooplankton are of great importance and vital to fish culture. Any changes in these parameters may affect the growth, development, and maturity of fish. Different causal influences, which determine the quality of water, show a characteristic change from season to season, were reported by (Shukla *et al.*, 2013).

Nutrients like Sulphates, Phosphates, and Nitrates are added through agricultural waste, which leads to eutrophication (Mitra, 1995). This resulted in a complete change in the biotic and abiotic components of this aquatic ecosystem. Ultimately most of the rivers are heavily polluted (Bhave and Borse, 2001; Mini et.al, 2003; Jayaraman et.al. 2003; Sinha, et.al, 2004).

Freshwater is a natural home of innumerable living things, many of them harmless or even beneficial, some of them directly or indirectly injurious to man. Environmental pollution affects the general quality of our health (Parimala *et al.* 1994). But yet there are several water bodies in the Parbhani district which are remained unnoticed.

This Reservoir has vast potential for fishery; hence Physico-chemical parameters and ichthyofaunal diversity of this reservoir have been taken for the present study For the scientific and proper management of the Niwali reservoir. Niwali Reservoir is an important aquatic ecosystem that is affected by various activities of man. These water bodies to be investigated are manmade reservoirs formed due to the construction of a reservoir on the Karpara rivers.

Review of literature

Prakash et al., (1989), during their studies, found that seasonal variations of Physico-chemical characteristics such as temperature, pH, dissolved oxygen, free carbon dioxide, carbonate, bicarbonate etc., due to sewage water discharged into the river Tawi.

Tripathi et al., (1991), during their studies they analysed sewage discharged into the river Ganga of Varanasi city and studied its Physico-chemical characteristics such as dissolved oxygen, BOD, acidity, alkalinity etc., and also analysis of variance revealed significant variations in most of the parameters concerning month and sites.

Saha et al., (2001), during their studies of a brackish water ecosystem of sundarsans in West Bengal, analyzed Physico-chemical characteristics concerning pollution and phytoplankton production potential of the site.

Ravindra et al., (2003), during their studies they published comprehensive data regarding seasonal variations in Physico-chemical characteristics of river Yamuna, Haryana. Murthy and Yajurvedi, (2006), during their studies they investigated physicochemical characteristics of the aquaculture body of Mysore city at Bilikere Lake for two years to know its suitability for pisciculture. During their study period, they observed that there were ups and downs in water temperature, TSS, Dissolved oxygen, nitrite and NH3 within limits, Whereas total alkalinity, and pH were increased than the desired limits. And also turbidity, BOD, phosphate, etc were found higher in a few months as compared to the desired limit for fish culture. Hence, higher levels of certain factors in the lake are due to access to agricultural runoff and frequent input of sewage flow.

Tripathi et al., (2006), they published their work on "A study involving qualitative assessment of river Gomti in Lucknow". Their result showed that there was an increase in river BOD, COD, alkalinity, chlorides, total hardness, conductivity, total solids and heavy metals (Fe, Pb, Cu, Zn, Cr) but dissolved oxygen and pH were decreased. It is observed that all the heavy metals except Iron were found to be within permissible limits.

Murugesan et al., (2007) they studied the Physico-chemical and biological quality of river Chittar at Courtallum, Tamil Nadu. During their studies, they observed analysis of various water samples revealed that although river water was not highly polluted, biological quality was significantly poor. Except for sulphate, all other Physico-chemical parameters were found to be within permissible limits. And also it is observed that the total faecal forms exceeded the permissible limits, indicating the poor status of the river. Bhandari et al., (2008), they studied the Physico-chemical characteristics of the Kosi river system in North India. They collected samples in the year 2004-2005 during all three seasons as summer, winter and monsoon. And their result showed that the selected parameters were within the prescribed limits set by WHO. They also observed that Turbidity and BOD showed elevated values compared to limits. Maximum values of magnesium and calcium may be credited to the mining of Dolomite and soil wearing away.

Joshi et al., (2009), studied Physico-chemical parameters of the river Ganga for drinking purposes. They selected various parameters and concluded that most of the water sample under study was suitable for drinking purposes except in the rainy season WQI increases due to increased concentration of sodium and dissolved solids. And hence there is a risk of getting cardiovascular diseases and also suggested that further improvement is required.

Singh and Mishra (2009), carried out studies on the Kuano river of eastern Uttar Pradesh, to know the occurrence of organochlorine pesticides residue in it. During the study period, they observed the presence of HCH and DDT through the usage of both pesticides were restricted. And it was also observed that the pesticides reside were higher than the normal range according to standards maintained in drinking water quality. And they also concluded that the degradation of an environment may be due to these pesticides compounds and thus it's harmful to humans and other organisms.

Bhandari et al., (2010) they studied the water quality of the Gurgaon canal in Haryana and they analysed Physico-chemical parameters such as pH, TDS, DO,

BOD etc as a result they found that parameters were high than the normal range, this may be due to waste entering into the canal.

Saxena et al., (2011) they carried out studies in the Chambal river, Madhya Pradesh. They worked on Physico-chemical parameters. Their study area lies under the "National Chambal Sanctuary" region. They analysed DO, turbidity, pH, EC, total hardness, total alkalinity, chloride, nitrates, sulphates, BOD, COD, Na, K etc. As result, the parameters examined were within the standard prescribed by Indian Standard Bureau. The study indicates that water is free from contamination.

Gorde et al., (2013) they studied Physico-chemical parameters in a lake in Pune, Maharashtra. They studied Physico-chemical parameters concerning planktons. And observed that most of the water quality parameters were higher in the wet season them in the dry season. They also stated that water quality is dependent on the type of pollutant added and the nature of the self-purification of water.

Singh et al., (2014) studied the Physico-chemical parameters of river Gomati in Uttarpradesh. Their studies dwelt with parameters such as calcium, manganese, iron, and chloride. They observed concentration levels of Iron and chloride were destructive to metallic pipes and structures as well as to crops.

Tiwari (2015) studied various Physico-chemical parameters in Bhopal, Madhya Pradesh. Some of the parameters have higher values when compared with the standards of WHO. And also it stated that this is due to industrial waste, and anthropogenic activity. They also suggested that this can be minimised by replacing some existing pulping, and bleaching techniques like bio-bleaching, bio-pulping, and ozone bleaching.

Kumar et al., (2017) studied the physical and chemical parameters of Krishna river water in Krishna District, Andhra Pradesh. They studied various Physico-chemical parameters. The obtained values were compared with standards WQI values and finally, it's concluded that the Krishna river water has good water quality.

Day (1889) studied fish fauna. They listed 1,418 species found in the territories of India, Myanmar, Sri Lanka etc. It is also illustrated in separate volumes. Ferraris et al., (2000) studied fresh water and marine water fish types in the Australian museum of Southern Asia. Ghate et al., (2002) studied fish fauna and collected a horned fish in the Nira river, a tributary of the Bhima river. They identified many fishes using the keys given by (Talwar and Jhingran, 1991).

Srivastava et al., (2004) studied the diversity of Inland fishes in India. According to them, museums across the world provide historical data on fishes their abundance and occurrence.

Devashish et al., (2006) studied the fish diversity and conservation aspects in northeastern India. They concluded that a typical fishery in tropical waters may lead to a harvest of a rich diversity of fish species. Managing for fish diversity provides a useful clue against uncertainties. Fisherman and Ichthyologists have a critical role to play in understanding and protecting the diverse range of fish resources. Chandanshiv et al., (2007) studied the fish fauna of the Pavana river of Pune. During their studies, they collected 59 species. They found three new species.

Objective of Research

1. Studies on Physico-chemical parameters of Niwali reservoir.

2. To study the ichthyofaunal diversity from the Niwali reservoir.

3. To find the interrelationship between ichthyofaunal diversity and Physico-chemical parameters.

4. To analyse the water quality of Niwali reservoir and compare it with the parameter of standard water quality.

5. To propose remedial steps for conservation of the present ecosystems.

Materials and Methods:

Methodology to be adopted

This is a very important section of the research that determines the success of achieving the objectives. Following standard methods and procedures will be carried out related to survey, collection, processing, and preservation of biological materials for the taxonomic study to identify the species diversity of fishes.

This study will be made to analyse the Physico-chemical parameters of the Niwali Dam. During this study, the water samples will collect early in the morning between 7.0 am to 8.30 am from different sites of the Niwali reservoir throughout the study for two years from April 2022 to April.2024. Three different spots will be selected for the sampling of the Niwali reservoir. The samples will be collected on separate days from each spot of the Niwali reservoir.

Studies on Physicochemical parameters of Niwali reservoir

Physical parameters will be analysed by using the standard method for the examination of water suggested by-American Public Health Association (APHA-1992) such as water temperature, humidity, pH, transparency, specific conductivity, T.D.S. etc. The **chemical parameters** will be checked like - D.O., free CO_2, alkalinity, carbonates, bicarbonates, total hardness, calcium, magnesium, chlorides, phosphates, and nitrates. etc.

To study the ichthyofaunal diversity of the water body

The Fish sampling will be carried out with the help of local fishermen and researchers themselves and by visiting the local fish market.

Taxonomy of Fishes:

The fish samples will be collected from the fishermen in the Niwali reservoir by random sampling the fish samples will be collected and identified with the help of photo and onboard measurement for morphometrics and meristic characters by using a veneer calliper scale. Micro-tissue samples and scales on the body will be collected for the molecular taxonomic study. Fish abundance by the number of fish species will be calculated. Fish will be identified using various literature like the freshwater

fishes of India, Pakistan, Bangladesh, Burma and Sri Lanka -a handbook *by* k. C. Jayaram.

Important of study

International status

Reservoirs are obstructing rivers worldwide, impairing habitat and migration opportunities for numerous freshwater fish species; however, global facts linking dam and fish distributions have been inadequate. Reservoirs constitute the main threat to global freshwater species diversity (Vörösmarty et al. 2010); they lead to the loss of native species but also to invasion by exotic species, partly because exotic species are likely to establish in degraded or modified freshwaters (Poff et al. 2007). The implications of reservoir obstruction for local freshwater diversity have been studied in small-scale studies (e.g., Anderson et al. 2006), but a paucity of global-scale information has constrained large-scale freshwater management planning (but see Thieme et al. 2007).

Reservoirs contribute to water security, energy supply, and flood protection but also fragment habitats of freshwater species. Yet, a global species-level examination of reservoir-induced fragmentation is lacking. Current levels of fragmentation were highest in the United States, Europe, South Africa, India, and China.

National status

India is the seventh-largest country in the world covering an area of 32, 87,590 sq. km, the largest landmass of the Indian subcontinent, and lies to the north of the equator between 6° 45′ (the southernmost extremity, the Indira Point in Great Nicobar Islands of the Indian territory) and 37° 6′ north latitude and 68° 7′ and 97° 25′ east longitude.

The freshwater ecosystems of India include all types of inland wetlands: lakes, rivers, ponds, streams, groundwater, springs, cave waters, floodplains, as well as bogs, marshes, and swamps. India with 2.4% of the global landmass has 4% of the world's freshwater resources (source: the Ministry of Water Resources, Govt. of India). The abundant water resources include 29,000 km of rivers, 3.15 million hectares of reservoirs, 2.35 million hectares of ponds and tanks, 0.2 million hectares of floodplains, and 33 wetlands (Ayyappan, 2007).

Therefore, there is a need to search for the current status of the diversity of Fish which is act as the major source of food. The present study identifies the exact physiochemical status of water from the Niwali reservoir. which helps in the successful Scientific management of reservoirs and the proposed work may help develop future planning of the reservoir. and effective management.

Significance of study:

i. To study the percentage of contaminants that are hazardous to human health and agricultural production.

ii. The current work will provide baseline data on the diversity of Fish Fauna of Niwali Reservoir.

iii. To study sustainable economic development of the community which is directly or indirectly dependent on the water bodies.

iv. To check the efficiency, uniformity, and consistency of the treatment and purification process.

v. To assess whether the water is suitable for agricultural, drinking, domestic purposes etc.

vi. To study proper utilization of natural resources.

vii. This study will also be helpful to provide a data bank for Hydrobiological studies.

viii. The study will help an important role in planning activation and strengthening Ichthyofaunal diversity.

Proposed plan of work

Year-wise work plan of research.

The research duration in the present study is about four years from Year March-2021 to Dec. 2024.

First-year – course work and extensive literature survey.

Second-year-protocol standardization and data collection

Third-year: Result data analysis.

Fourth-year: research paper publication, thesis writing, and submission of thesis.

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